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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/697,137	10/30/2003	Jeffrey A. West	TI-36238	9756
23494	7590	07/18/2006	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			GUERRERO, MARIA F	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 07/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/697,137

Applicant(s)

WEST ET AL.

Examiner

Maria Guerrero

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 April 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 and 9-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 9-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action is in response to the amendment filed April 25, 2006.

Status of Claims

2. Claim 8 is canceled. Claims 1-7 and 9-12 are pending.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-7 and 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zistl et al. (U.S. 6,806,191) in view of Yu et al. (US 6,764,952).

Zistl et al. teaches forming a dielectric layer, forming openings in the dielectric layer, filling the openings with a barrier, a copper seed and an electroplated copper film

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(Fig. 1a, col. 4, lines 35-67, col. 5, lines 1-5). Zistl et al. shows chemically-mechanically polishing the copper film and gaseously doping the copper film with silicon (copper/silicon film 107) (not copper silicide) (Fig. 1b, 3a, Abstract, col. 5, lines 1-40, col. 6, lines 7-31). Zistl et al. discloses the dielectric layer comprising an interlevel dielectric having vias and an intrametal dielectric having trenches (col. 4, lines 35-55). Zistl et al. teaches doping only a top region of the copper film with silicon by flowing silane at a temperature of about 350°C to about 420 °C for about 3 to about 10 seconds (col. 5, lines 60-63, col. 6, lines 8-32). Zistl et al. shows the doping as part of a silicon nitride deposition process (Abstract, col. 7, lines 20-40).

Zistl et al. teaches transferring the semiconductor body to a chamber, performing the doping by flowing silane for a given time prior striking a plasma in the chamber (Abstract, col. 6, lines 7-10). Zistl et al. shows striking the plasma after flowing the silane for about 3 seconds (at least 0.5 seconds is included) and flowing at least one nitrogen-containing source gas into the chamber to deposit a silicon nitride layer over the copper interconnect (Abstract, col. 6, lines 8-65, col. 7, lines 13-40).

Zistl et al. is silent about the gas chemistry consisting of silane. However, Yu et al. shows shows chemically-mechanically polishing the copper film and gaseously doping the copper film with silicon without forming a copper silicide by flowing a gas chemistry consisting of silane over the copper film (Fig. 1, col. 4, lines 25-55, col. 5, lines 1-60).

Zistl et al. does not specifically show the final bulk silicon concentration in the range as claimed. However, "where the general conditions of a claim are disclosed in

the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to specify the range as claimed by routine experimentation because there is not evidence of criticality. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). See MPEP § 716.02 - § 716.02(g).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to specify the gas chemistry consisting of silane as taught by Yu et al. in order to prevent oxidation of the copper surface (Yu et al., col. 4, lines 40-44).

Response to Arguments

4. Applicant's arguments with respect to claims 1-7 and 9-12 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

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TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

July 8, 2006

Maria Guerrero
MARIA F. GUERRERO
PRIMARY EXAMINER